MORE ON REPRESENTING DATA, ANALYZING DATA, AND INTERPRETING RESULTS
Session 4

Topic	Activity Name	Page Number	Related SOL	Activity Sheets	Materials
Representing Data	Attributes of Circle Graphs	100	6.18, 8.12	Thirds, Fourths, Fifths, Sixths, Eighths, Mystery Graphs	
	Construct-ing Circle Graphs	107	**6.18, 8.12**	Favorite Ice Cream, Favorite Amusement Park Rides, Favorite Chocolate Treat	Protractors, compasses, rulers
	Frequency Distributions and Histograms	111	7.17, 8.12	Hand Full Sheet, First Histogram, Refined Histogram, Attribute Sheet	Bag of counters, rulers
	When It Rains	118	4.20, 5.18, 6.18, 8.12	When It Rains	
Analyzing the Data	Let the Graph Do the Talking	121	1.19, 2.23, 4.20, 5.18, 3.22, 6.18, 7.18, 8.12	Example Graph 1, Example Graph 2	
	Matching Game: Graphs, Data, Summary	125	1.19, 2.23, 3.22, 6.18, 7.18, 8.12	Matching Graphs, Data and Narratives (18 Sheets)	Large index cards on which to mount the data
	Name That Graph	144	4.20, 5.18, 6.18, 7.17, 8.12	Name That Graph graphs and Recording Sheet	
	Draw the Graph	147	1.19, 2.23, 3.22, 4.20, 5.18, 6.18, 7.18, 8.12	3 Graphs	
	Interpreting the Data to Inform the Question	151	All K-8 Statistics SOL	Sample Questions	

Activity: Attributes of Circle Graphs

Format: Large Group/Individual/Small Group

Objectives: Participants will analyze fraction, percent, and central angle relationships in circle graphs.

Related SOL: 6.18, 8.12

Materials: Concept Activity Sheets of circle graphs (THIRDS, FOURTHS, FIFTHS, SIXTHS, and EIGHTHS), each marked or to be marked and shaded (or colored) with a fractional part, a percent, and the measure of the central angle. Concept Understanding Assessment Activity Sheet: Mystery Circle Graphs
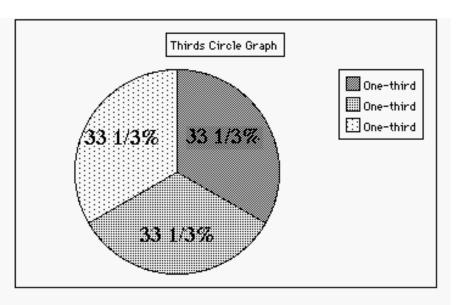
Time Required: 10 minutes

Directions:
1. The participants are each given an activity sheet to complete, followed by the instructor's questions related to the shading completed (THIRDS, FOURTHS, FIFTHS).
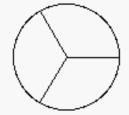
2. The participants shade a part of the interiors for SIXTHS and name the measures of the central angles. The instructor's questions about equivalents follow.

3. The participants shade a part of the interiors for EIGHTHS and name the percent equivalents and measures of the central angles. The instructor's questions about equivalents follow.

4. The participants use information from their THIRDS, FOURTHS, FIFTHS, SIXTHS, and EIGHTHS Activity Sheets to assist in completing the Mystery Circle Graphs activity.
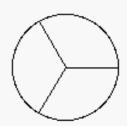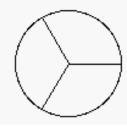
THIRDS

Thirds Circle Graph

One-third
One-third
One-third

33 1/3%   33 1/3%

33 1/3%

Shade 1/3 of the circle.

Shade 33 1/3% of the circle.

Shade a 120° angle.

Shade 2/3 of the circle.
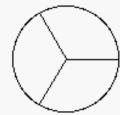
Shade 66 2/3% of the circle.

Shade a 240° angle.

Shade 3/3 of the circle.
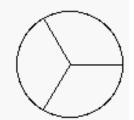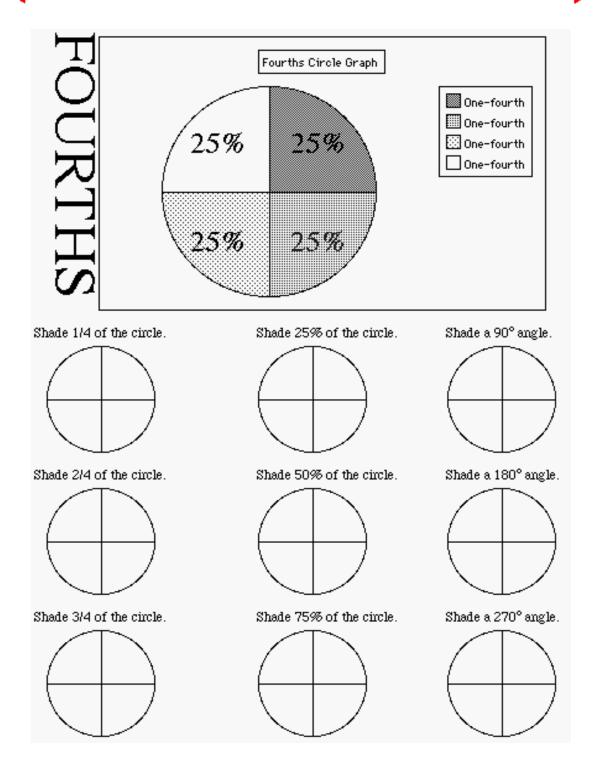
Shade 100% of the circle.

Shade a 360° angle.

FOURTHS

Fourths Circle Graph

Legend:
- One-fourth
- One-fourth
- One-fourth
- One-fourth

25% 25%

25% 25%

Shade 1/4 of the circle.

Shade 25% of the circle.

Shade a 90° angle.

Shade 2/4 of the circle.

Shade 50% of the circle.

Shade a 180° angle.

Shade 3/4 of the circle.

Shade 75% of the circle.

Shade a 270° angle.
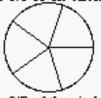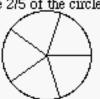
FIFTHS

Fifths Circle Graph

20% 20%

20% 20%

20%

One-fifth
One-fifth
One-fifth
One-fifth
One-fifth

Shade 1/5 of the circle.

Shade 20% of the circle.

Shade a 72° angle.

Shade 2/5 of the circle.
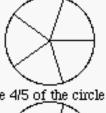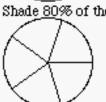
Shade 40% of the circle.

Shade a 144° angle.

Shade 3/5 of the circle.
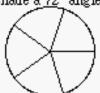
Shade 60% of the circle.

Shade a 216° angle.

Shade 4/5 of the circle.
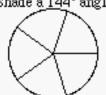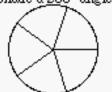
Shade 80% of the circle.
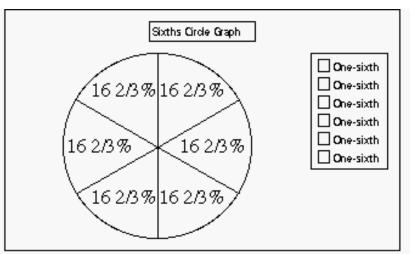
Shade a 288° angle.

SIXTHS

Sixths Circle Graph

16 2/3% | 16 2/3%
16 2/3% | 16 2/3%
16 2/3% | 16 2/3%

☐ One-sixth
☐ One-sixth
☐ One-sixth
☐ One-sixth
☐ One-sixth
☐ One-sixth

Shade 1/6 of the circle.

Shade 16 2/3%.

Shade a ___° angle.

Shade 2/6 of the circle.

Shade 33 1/3%.

Shade a ___° angle.

Shade 3/6 of the circle.

Shade 50%.

Shade a ___° angle.

Shade 4/6 of the circle.

Shade 66 2/3%.

Shade a ___° angle.

Shade 5/6 of the circle.

Shade 83 1/3%.

Shade a ___° angle.

EIGHTHS

Eighths Circle Graph
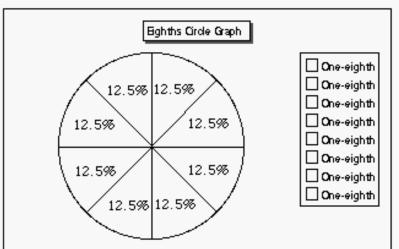
12.5%	12.5%
12.5%	12.5%
12.5%	12.5%
12.5%	12.5%

☐ One-eighth
☐ One-eighth
☐ One-eighth
☐ One-eighth
☐ One-eighth
☐ One-eighth
☐ One-eighth
☐ One-eighth

Shade 1/8 of the circle.

Shade _____ %.

Shade a ___° angle.

Shade 2/8 of the circle.

Shade _____ % .

Shade a ___° angle.

Shade 3/8 of the circle.

Shade _____ % .

Shade a ___° angle.

Shade 4/8 of the circle.

Shade _____ % .

Shade a ___° angle.

Shade 5/8 of the circle.

Shade _____ % .

Shade a ___° angle.

Shade 6/8 of the circle.

Shade _____ % .

Shade a ___° angle.

Shade 7/8 of the circle.

Shade _____ % .

Shade a ___° angle.

Mystery Circle Graphs

For each sector in the circle graph, find the fractional part represented, the percent of the whole circle, and the measure of the central angle.

Mystery Circle Graph 1

☐ You decide.
☐ You decide.
☐ You decide.

Fraction			
Percent			
Central Angle			

Mystery Circle Graph 2

☐ You decide.
☐ You decide.
☐ You decide.

Fraction			
Percent			
Central Angle			

Mystery Circle Graph 3

☐ You decide.
☐ You decide.
☐ You decide.

Fraction			
Percent			
Central Angle			

Mystery Circle Graph 4

☐ You decide.
☐ You decide.
☐ You decide.

Fraction			
Percent			
Central Angle			

Activity: Constructing Circle Graphs

Format: Large Group/Individual/Small Group

Objectives: Participants will analyze data by displaying it in circle graphs.

Related SOL: 6.18, 8.12

Materials: Compasses, rulers, protractors, construction of a circle graph activity sheet (Favorite Amusement Park Rides), circle graph construction assessment activity sheet (Favorite Chocolate Treat)

Time Required: 20 minutes

Directions:
1. The instructor describes the attributes of a circle graph and demonstrates how the sectors are determined.

   A circle graph is a graph of data in which parts of a whole are represented as sectors of a circle.

   Each sector, or pie-shaped wedge, usually contains the actual number or percent of the whole and a label of what the part represents. Some circle graphs use a legend to label the sectors of the graph. A sector is bound by two radii and an arc of the circle. An arc is part of a circle connecting two points on the circle. The whole is represented by the area of the circle. The parts are represented by the areas of sectors of the circle. The graph has a descriptive title.
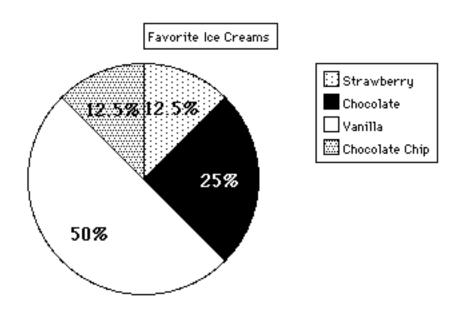
   The instructor's explanation includes all the attributes described.

2. The instructor provides a set of data (Favorite Amusement Park Rides Activity Sheet) for the participants to generate a circle graph. Participants work in pairs to construct the graph, share their results with another pair of participants, and assess whether or not they have included all the attributes of a well-constructed circle graph.

3. The instructor provides a set of data (Favorite Chocolate Treat Activity Sheet) for each participant to generate a circle graph. Participants work individually to construct the graph and self-assess whether or not they have included all the attributes of a well-constructed circle graph.

FAVORITE ICE CREAM

Flavor	# of Students	Fraction		Central Angle
Strawberry	3	3/24	or 1/8	45°
Chocolate	6	6/24	or 1/4	90°
Vanilla	12	12/24	or 1/2	180°
Chocolate Chip	3	3/24	or 1/8	45°
Total	24	24/24		360°
	Students	Fraction		Central Angle

Favorite Ice Creams

Legend:
- Strawberry
- Chocolate
- Vanilla
- Chocolate Chip
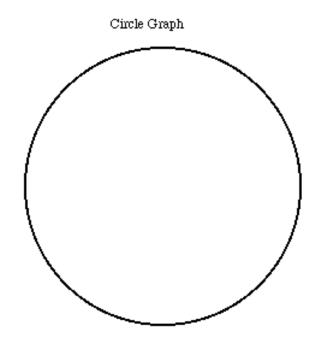
Favorite Amusement Park Rides

Use the information in the chart to make a circle graph of the favorite amusement park rides of the students surveyed.

Favorite Ride	Number of Students	Fraction	Central Angle
Sea Monster	16		
Twizzler	12		
Super Spin	8		
Water Log	6		
Wall Climber	6		
Total			
	Students	Fraction	Central Angle
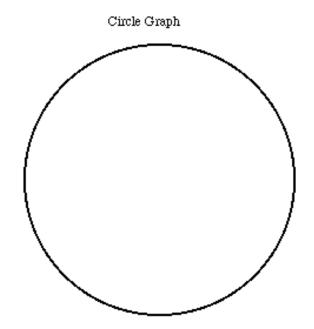
Circle Graph

Explain what the graph tells you about the students' preferences for amusement park rides.

Favorite Chocolate Treat

Use the information in the chart to make a circle graph of the favorite chocolate treat of the students surveyed.

Favorite Chocolate Treat	Number of Students	Fraction	Central Angle
Chocolate Cake	6		
Chocolate Ice Cream	12		
Chocolate Chip Cookie	20		
Chocolate Candy	16		
Chocolate Milk	6		
Total	Students	Fraction	Central Angle

Circle Graph

Explain what the graph tells you about the students' preferences for chocolate treats.

Activity: Frequency Distributions and Histograms

Format: Large Group/Individual/Small Group

Objective: Participants will analyze data by sorting, classifying, and displaying it in frequency distributions and histograms.

Related SOL: 7.17, 8.12

Materials: One bag of counters, rulers, data collection activity sheet (Hand Full), First Histograms Activity Sheet, Refined Histograms Activity Sheet, Attributes of Frequency Distributions and Histograms Information Sheet

Time Required: 30 minutes

Directions:
1.   The instructor explains the procedure that initiates the lesson.

   Each participant will make an estimate of how many counters he/she can grasp in one hand from the bag of counters. Each participant will declare his/her estimate and all participants will write the number estimated in the Estimate column on their Hand Full Activity Sheets.

   Each participant, in turn, will grasp as many counters as he/she can from the bag of counters, count the number of counters, and return the counters to the bag. The student will declare orally the number of counters grasped. All participants will write down the number grasped in the Actual column on the Hand Full Activity Sheets.

2.   Using the data in the Estimate column, participants count the number of pieces of data that belong to each interval in the frequency distribution for the estimates and record it in the Frequency column in the frequency distribution of the estimates.

3.   Using the data in the Actual column, participants count the number of pieces of data that belong to each interval in the frequency distribution for the actual number grasped and record it in the Frequency column in the frequency distribution of the actuals.

4.   The instructor explains to the participants to construct bars on the First Histograms Activity Sheet. (Note: Graphs are not likely to accurately reflect all of the attributes of histograms that the instructor will next describe.)

5. The instructor explains the process that the participants experienced in making their first histograms from collecting data to putting the data in intervals to drawing a histogram. The instructor then defines and describes frequency distributions and histograms in terms of the way a statistician thinks.

    A frequency distribution is a chart that shows the number of times that a particular measure or observation occurs.

    The chart contains two columns. The first column lists all the measures (from highest to lowest) or observations. The second column gives the frequency, or number of times, that the measure or observation occurred.

    Usually, the first step in making a frequency distribution is to list the possible measures or observations (first column) and then go through the data and make tally marks (second column) every time a measure or observation occurs. Then, the number of tally marks for each measure or observation is counted to find the frequency. Measures in a frequency distribution are usually grouped into intervals if the difference between the highest and lowest measures is 20 or greater.

    To decide the size of an interval, the range (the difference between the highest and lowest measures) is divided by the desired number of intervals. If the quotient does not come out even, statisticians usually round it to the nearest odd number.

    A histogram is a special type of bar graph in which the categories are equal ranges (intervals) of numbers and there are no spaces between the bars. The height of each bar is the numerical count of numbers in the range (interval).

    The center of the horizontal axis is usually the midpoint of the intervals. It is customary to start with the lowest value on the left and proceed to the right with as many intervals as are necessary to include all the data. The horizontal axis does NOT need to begin at zero. An empty interval should be left at the lower and upper ends of the axis.

    The vertical axis is the frequency of numbers in an interval. The vertical axis is marked off beginning with zero at the bottom and proceeding to the highest frequency. When statisticians graph frequency distributions, they use the "three-quarter-high rule" which means that the height of the highest bar is approximately three-fourths of the length of the horizontal axis. This rule prevents personal bias from influencing the height of the vertical axis. The vertical axis should be labeled "frequency" and the horizontal axis should be labeled to describe what is being measured.

The graph should have a descriptive title.

The instructor's explanation should have all the attributes described.

6. Following the instructor's explanation, the participants are given a blank Refined Histogram Activity Sheet and a written copy of the instructor's description of a frequency distribution and histogram, Attributes of Frequency Distributions and Histograms.

7. The participants work in pairs to construct a refined histogram using the frequency distribution of their estimates of the number of chocolate bars they could grasp.

8. When the pairs of participants have completed their histograms, they share them with other participants and assess whether or not they have included all the attributes of a well-constructed histogram.

9. The participants work individually to construct a refined histogram using the frequency distribution of the actual number of chocolate bars they grasped.

10. When the participants have completed their histograms, they share them with other participants and assess whether or not they have included all the attributes of a well-constructed histogram.

Hand Full
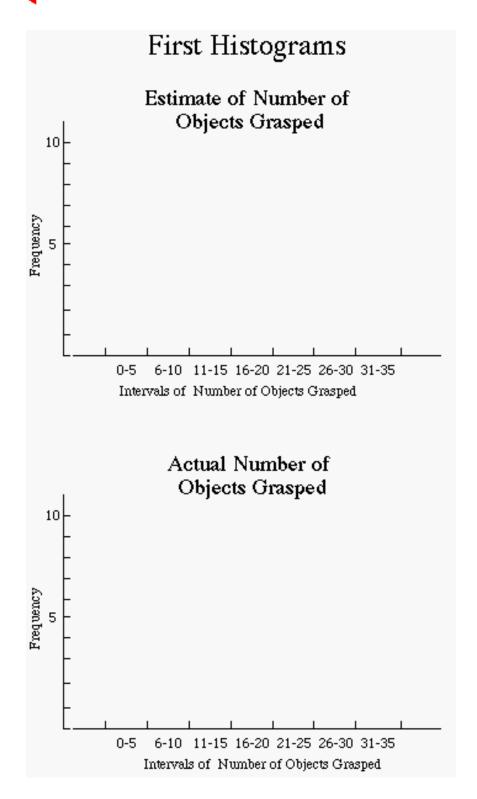
Number of Objects Grasped
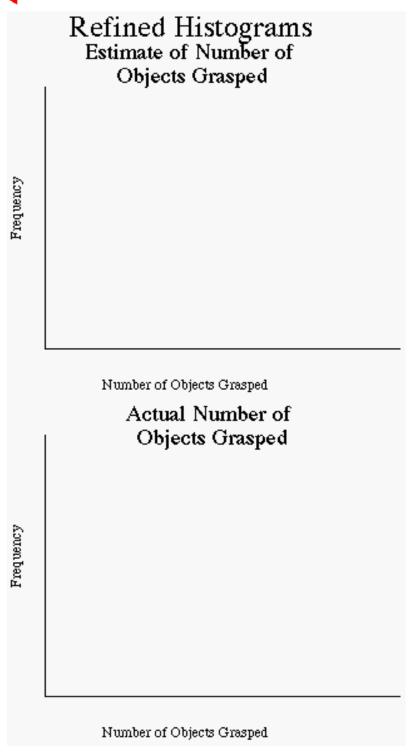
Student	Estimate	Actual

Frequency Distribution Estimate

Interval	Frequency
0-5	
6-10	
11-15	
16-20	
21-25	
26-30	
31-35	

Frequency Distribution Actual

Interval	Frequency
0-5	
6-10	
11-15	
16-20	
21-25	
26-30	
31-35	

First Histograms

Estimate of Number of Objects Grasped

Frequency

10 —

5 —

0-5   6-10   11-15   16-20   21-25   26-30   31-35

Intervals of Number of Objects Grasped

Actual Number of Objects Grasped

Frequency

10 —

5 —

0-5   6-10   11-15   16-20   21-25   26-30   31-35

Intervals of Number of Objects Grasped

Refined Histograms
Estimate of Number of Objects Grasped

Frequency

Number of Objects Grasped

Actual Number of Objects Grasped

Frequency

Number of Objects Grasped

Attributes of Frequency Distributions and Histograms

- A **frequency distribution** is a chart that shows the number of times that a particular measure or observation occurs.

- The chart contains two columns. The first column lists all the measures (from highest to lowest) or observations. The second column gives the frequency, or number of times, that the measure or observation occurred.

- Usually the first step in making a frequency distribution is to list the possible measures or observations (first column) and then go through the data and make tally marks (second column) every time a measure or observation occurs. Then the number of tally marks for each measure or observation is counted to find the frequency. Measures in a frequency distribution are usually grouped into intervals if the difference between the highest and lowest measures is 20 or greater.

- To decide the size of an interval, the range (the difference between the highest and lowest measures) is divided by the desired number of intervals. If the quotient does not come out even, statisticians usually round it to the nearest odd number.

- A **histogram** is a special type of bar graph in which the categories are equal ranges (intervals) of numbers and there are no spaces between the bars. The height of each bar is the numerical count of numbers in the range or interval.

- The center of the horizontal axis is usually the midpoint of the intervals. It is customary to start with the lowest value on the left and proceed to the right with as many intervals as are necessary to include all the data. The horizontal axis does NOT need to begin at zero. An empty interval should be left at the lower and upper ends of the axis.

- The vertical axis is the frequency of numbers in an interval. The vertical axis is marked off beginning with zero at the bottom and proceeding to the highest frequency. When statisticians graph frequency distributions, they use the "three-quarter-high rule" which means that the height of the highest bar is approximately three-fourths of the length of the horizontal axis. This rule prevents personal bias from influencing the height of the vertical axis. The vertical axis should be labeled "frequency" and the horizontal axis should be labeled to describe what is being measured.

- The graph should have a descriptive title.

Activity: When It Rains

Format: Pairs

Objective: Participants will use their knowledge of line graphs to match graphs with data sets.

Related SOL: 4.20, 5.18, 6.18, 8.12

Materials: When It Rains Activity Sheet

Time Required: 20 minutes

Background: A line graph is used to show changes over time for continuous data. Points are plotted on the coordinate plane to represent change over time or any linear function. The units of division on the axes are evenly spaced and plotted points are connected by line segments or dotted line segments.

Multiline graphs are used to compare two or more sets of continuous data over time.
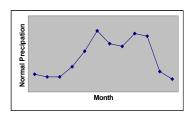
Directions:
1. Distribute When It Rains Activity Sheet.
2. Have the participants match each line graph to its data set.
3. Have the pairs write a paragraph describing the analytical process used.
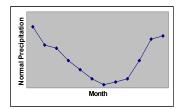
When It Rains

1.

2.
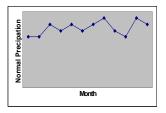
3.
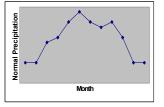
4.

5.

6.

When It Rains

NORMAL PRECIPITATION/SNOWFALL
(in centimeters)

	Kansas City	New York	Fairbanks	Honolulu	Eureka	Miami
Jan.	4	8	3	12	20	7
Feb.	4	8	2	7	14	6
Mar.	8	10	2	9	13	6
Apr.	10	9	2	5	9	10
May	12	10	3	4	6	16
Jun.	15	9	5	2	3	24
Jul.	12	10	6	3	1	19
Aug.	11	11	7	3	2	18
Sep.	12	9	4	3	3	23
Oct.	9	8	3	5	9	22
Nov.	5	11	3	9	16	8
Dec.	5	10	3	10	18	4

Activity: Let the Graph Do the Talking

Format: Whole group

Objectives: Participants will develop skills in interpreting graphical representations of data. They will discuss statistics that can be developed from graphs, compare and contrast data, find unique and common features, describe trends and relationships between variables, and make predictions from the data.

Related SOL: 1.19, 2.23, 3.22, 4.20, 5.18, 6.18, 7.18, 8.12

Materials: Graph, data, and written summary cards for matching, example graphs for discussion, and graphs for participants to analyze (types of graphs and level of analysis should vary depending on the grade level of the participants), Graph 1 and Graph 2 Activity Sheets

Time Required: 10 minutes

Background: Once students have learned how to display data in graphs, it is very important that they are able to summarize what they see in the graph. This interpretation should include drawing conclusions, comparing and contrasting, predicting, and examining relationships. Of course, the type of analysis that can be done depends on the data and the graph. Some examples used in these activities include the following:

A **bar graph** enables the researcher to compare how many subjects fall into specific categories. For example, a bar graph could show how many adults earned less than a high school education, earned a high school education, completed some college, and earned a college education. By examining the graph, determine how well the population is educated, comparing the number of people in each of the four groups.

A **scatterplot** enables the researcher to determine trends, make predictions, or see if there is a relationship between two variables. For example, a scatterplot could show the trend in median income of college graduates overtime. From this graph, use what happened historically to predict what might happen to income in the future.

A **line plot** enables the researcher to examine the distribution of a single variable. A line plot could illustrate the number of fat

grams in food purchased from a fast food restaurant. It shows how many foods had very few grams of fat versus many grams of fat. Draw a conclusion regarding how healthy the food is at such a restaurant.

A **box-and-whiskers** plot shows the researcher the spread and center of the data. These graphs are great tools for comparing two sets of data. Two box-and-whiskers plots could be used to illustrate the number of calories of various brands of ice cream and yogurt. Compare ice cream and yogurt from the graphs to determine which product tends to have more calories and which product has a larger variation in calories among the different brands. Being able to interpret graphs and data give students the ability for making decisions in their own lives.

Directions:
1. Start with a graph from the newspaper or the example graphs provided. Show the graph to the participants and ask the participants to describe what information and interpretation can be taken from the graph.

2. Lead this discussion with probing questions such as those given in the examples below.

Two Example Graphs and Leading Questions

Bar Graph of Births for each Month
• Which months had the most number of births?
• Did one part of the year tend to have more births than another part of the year?
• How does the number of births in November compare to the number of births in July?
• Is there a trend during the year?
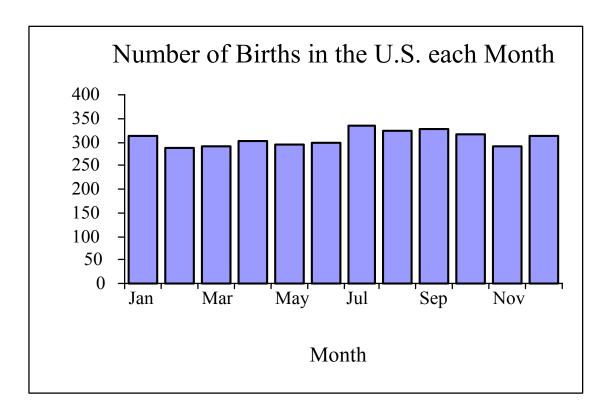
Line Plot of the Number of Days of Thunderstorms
• What was the most number of days of thunderstorms? the least number of days?
• Would you consider either of these points an outlier?
• What would you estimate to be the average number of thunderstorms for these cities?
• Is the data skewed left or right? What does this fact tell us about the distribution of thunderstorms in each city?

Example Graph 1

Number of Births in the U.S. each Month

- Which months had the most number of births?

- Did one part of the year tend to have more births than another part of the year?

- How does the number of births in November compare to the number of births in July?

- Is there a trend during the year?

Example Graph 2

**Number of Days per Year of
Thunderstorms for Various Cities**

```
     X        X    X
     X        X  X X X              X
  XXXX  X   X  X X X XX        X   X              X
  XXXX  X   X  X X X XXX X X X X  X X   X    X    X X
  +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
  0    10    20    30    40    50    60    70    80    90   100
```

Number of Thunderstorms

- What was the most number of days of thunderstorms? the least number of days?

- Would you consider either of these points an outlier?

- What would you estimate to be the average number of thunderstorms for these cities?

- Is the data skewed left or right? What does this fact tell us about the distribution of thunderstorms in each city?

Activity: Matching Game: Graphs, Data, Summary
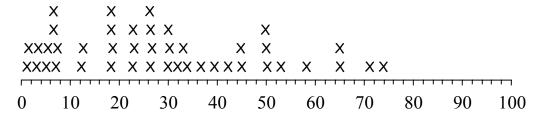
Format: Large Group Matching to Form Groups of Three

Objectives: Participants will develop skills in interpreting graphical
representations of data. They will discuss statistics that can be
developed from graphs, compare and contrast data, find unique
and common features, describe trends and relationships
between variables, and make predictions from the data.

Related SOL   1.19, 2.23, 3.22, 6.18, 7.18, 8.12

Materials: Graph, data, and written summary cards for matching,
Matching Game Activity Sheet

Time Required: 15 minutes
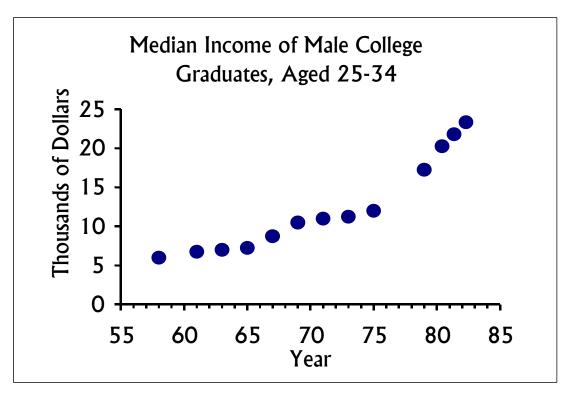
Directions:
1. Distribute the graph, data, and summary cards. Each participant should
   receive only one card. There are three cards that represent the same set of
   data. One card will have the raw data, a second card will have a graph of the
   data, and the third card will have a written summary of the data and graph.
   There are three sets of three cards representing the following data:
   • Calories in Ice Cream and Yogurt
   • Income for Male College Graduates
   • Fat grams in Fast Food
   • Level of Education for Adults

2. Because there are three sets for each of the above, the participants cannot
   determine their match by just looking at the titles. The participants must sort
   out which data matches the graph and summary. There are a total of 36
   cards. If there are fewer than 36 participants, remove cards in matching
   sets.

3. Use one matching set of cards as a demonstration. Show the data, discuss
   what type of graph would be appropriate for this data, provide an example
   graph that could be used for the data, and discuss the conclusions that can
   be drawn from the graph and the data, showing an example write-up of the
   data.

4. Participants should circulate around the room to find the two people who
   have cards that match their card.

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Year	Income
58	6
61	6.8
63	6.9
65	7.3
67	8.7
69	10.4
71	10.9
73	11.3
75	12.1
79	17.2
81	20.3
82	21.1
83	21.9

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Median Income of Male College Graduates, Aged 25-34

DATA-GRAPH-SUMMARY MATCH ACTIVITY
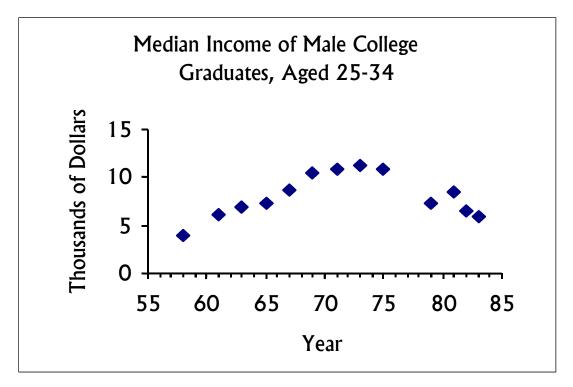
The graph illustrates the median income of college graduates, aged 25 - 34. It shows an upward trend in income over the past 25 years from 1958 to 1983. It appears that incomes rose slowly from 1958 to 1975 and then rose more rapidly from 1975 to 1983, with the largest one-year increase in the late seventies.

DATA-GRAPH-SUMMARY MATCH ACTIVITY
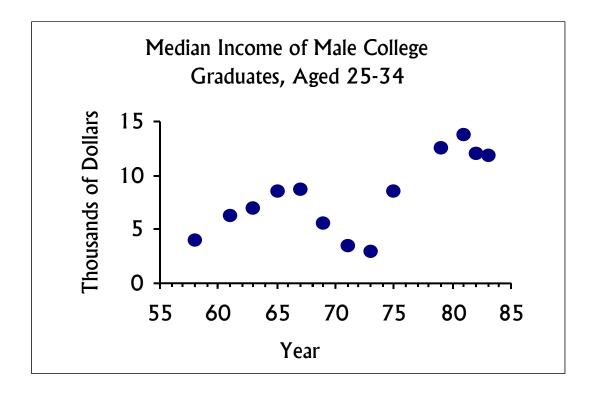
Year	Income
58	4
61	6.2
63	6.9
65	7.3
67	8.7
69	10.4
71	10.9
73	11.3
75	10.9
79	7.3
81	8.5
82	6.5
83	6

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Median Income of Male College Graduates, Aged 25-34

DATA-GRAPH-SUMMARY MATCH ACTIVITY

The graph illustrates the median income of college graduates, aged 25 - 34. It illustrates that income rose during approximately the first twenty years of this analysis from 1958 to 1973. After 1973, incomes began declining, dropping rapidly from 1975 and 1978.

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Year	Income
58	4
61	6.2
63	7
65	8.5
67	8.7
69	5.5
71	3.5
73	3
75	8.5
79	12.5
81	13.8
82	12
83	11.8

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Median Income of Male College Graduates, Aged 25-34

DATA-GRAPH-SUMMARY MATCH ACTIVITY
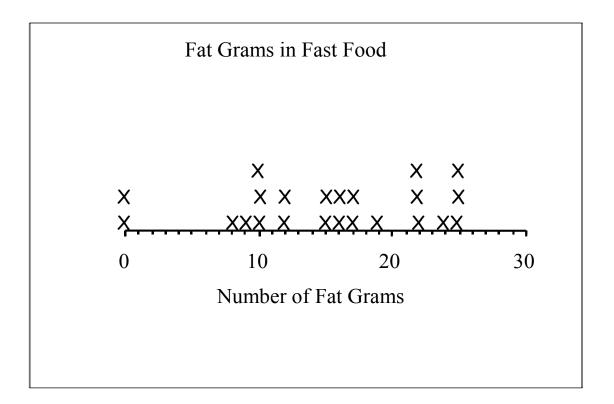
The graph illustrates the median income of college graduates, aged 25 - 34. The graph suggests that median income followed a cyclical pattern during the years from 1958 to 1983. Specifically, the median income rose steadily from 1958 to 1967, declined rapidly from 1967 to 1973, rose rapidly form 1973 to a peak of approximately $15,000 in 1982 before leveling off in 1982 and 1983.

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Fat Grams in Fast Food

0	22
17	17
12	12
16	0
9	8
10	16
22	15
15	10
25	25
10	19
22	24
25	

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Fat Grams in Fast Food

```
                             X                   X   X
     X                 X  X    XXX          X      X
     X _____XXX_X___XXX_X____X_XX_____
       |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
       0           10          20          30
```

Number of Fat Grams

DATA-GRAPH-SUMMARY MATCH ACTIVITY

The data represent the number of fat grams in food purchased from a fast food restaurant. The graph shows that the amount of fat grams range from 0 grams to approximately 25 grams. There are a few items with zero grams of fat, most likely diet soda. However, most of the items have over 10 grams of fat.

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Fat Grams in Fast Food

20	28
4	5
1	20
30	1
20	25
2	1
2	30
3	24
25	5
6	30
4	24
25	6

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Fat Grams in Fast Food

```
X                       X     X       X
XX  XXX                 X     XX      X
XXXXXX                  X     XX    X X
_____
0          10          20          30
```
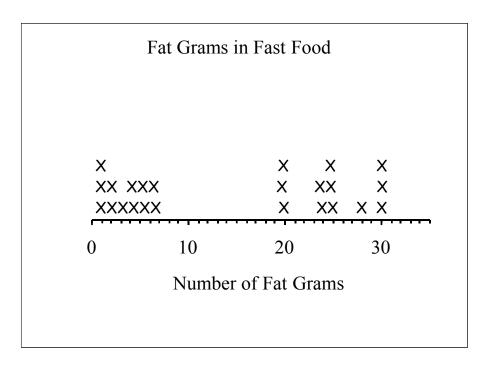
Number of Fat Grams

DATA-GRAPH-SUMMARY MATCH ACTIVITY

The data represent the number of fat grams in food purchased from a fast food restaurant. The graph shows that there appears to be two clusters of data, relatively healthy food with between 1 and 6 grams of fat and food that is not healthy with between 20 and 30 grams of fat.

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Fat Grams in Fast Food

31	27
27	30
16	4
0	28
26	5
16	30
7	5
25	25
26	28
28	25
26	29
31	34

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Fat Grams in Fast Food

```
                                                    XX  X
              X                   X                 XXXXXX
   X     XX  X                    X                 XXXXXX  X
  |_____|
   0           10          20          30
```

Number of Fat Grams

DATA-GRAPH-SUMMARY MATCH ACTIVITY
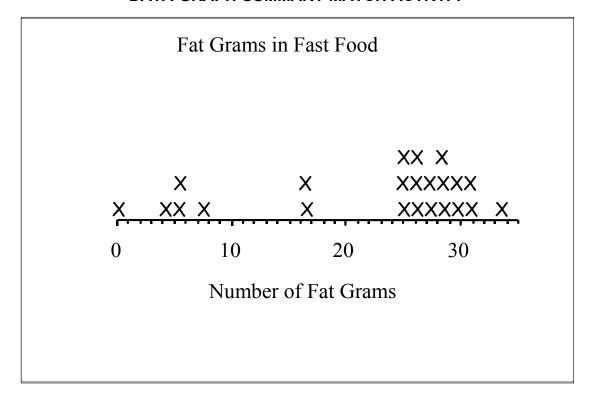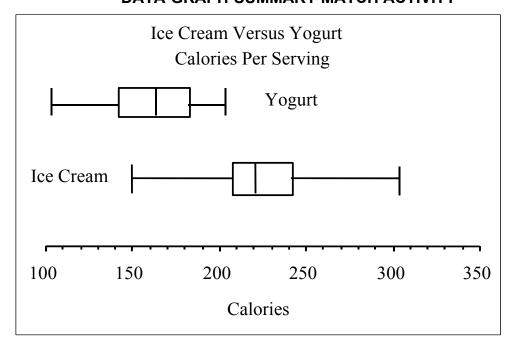
The data represent the number of fat grams in food purchased from a fast food restaurant. The graph shows that the amount of fat grams ranges from 0 grams to approximately 34 grams. There is a cluster of items around 5 to 8 grams but the largest cluster is between 25 and 31 grams. This cluster at the high fat contents implies that fast food is very high in fat grams.

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Calories per Serving

Ice Cream	Yogurt
150	100
150	120
175	125
200	130
205	140
205	150
210	155
215	155
215	160
220	165
225	170
225	170
230	175
240	180
250	180
275	185
300	190
305	200

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Ice Cream Versus Yogurt
Calories Per Serving

Yogurt

Ice Cream

100   150   200   250   300   350

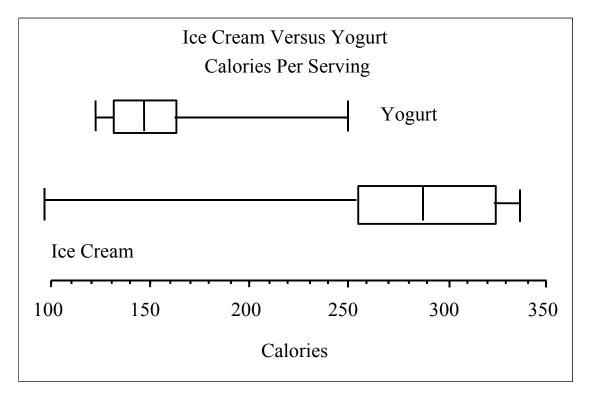Calories

DATA-GRAPH-SUMMARY MATCH ACTIVITY

The data represent the number of calories in a serving of various brands of ice cream and yogurt. It appears that ice cream generally has more calories. Its median is approximately 220 calories compared to 160 calories for yogurt. Yogurt also has less variation in calories as seen in the lower range of values-- yogurt ranges from a low of 100 calories to a high of 200 calories, a range of 100 calories, compared to ice cream which ranges from 150 calories to over 300 calories, a range of 150 calories.

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Calories per Serving

Ice Cream	Yogurt
100	120
150	125
180	125
250	125
255	130
260	135
275	135
275	140
275	140
300	150
300	150
310	155
325	155
325	160
325	170
325	180
340	190
340	250

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Ice Cream Versus Yogurt
Calories Per Serving

Yogurt

Ice Cream

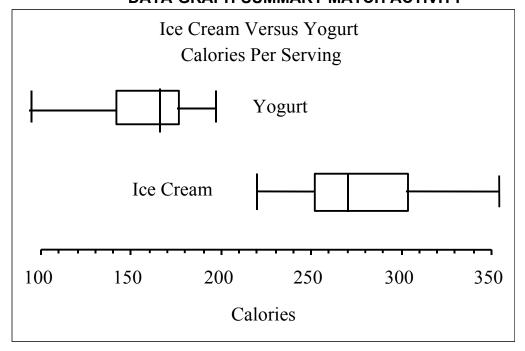|					
100	150	200	250	300	350

Calories

DATA-GRAPH-SUMMARY MATCH ACTIVITY

The data represent the number of calories in a serving of different brands of ice cream and yogurt. The graph illustrates that ice cream generally has more calories. Seventy-five percent of the ice cream brands have more than 250 calories, as seen by the fact that the box--the middle 50%--and right whisker-- the top 75%-- is above 250 calories. The ice cream brands are skewed left with a high concentration in the high end of the scale. In contrast, the lower seventy-five percent of the yogurt brands is below 170 calories. In other words, the yogurt brands' calories are skewed right. Furthermore, the median number of calories for yogurt is approximately 150 calories compared to nearly 300 calories for ice cream. We can also see from the graph that ice cream brands have more variation in calories than yogurt.

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Calories per Serving

Ice Cream	Yogurt
220	100
220	100
240	100
240	120
250	140
250	140
260	150
260	150
270	160
270	170
300	170
300	170
300	170
300	180
345	185
345	185
350	190
350	200

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Ice Cream Versus Yogurt
Calories Per Serving

Yogurt

Ice Cream

100   150   200   250   300   350

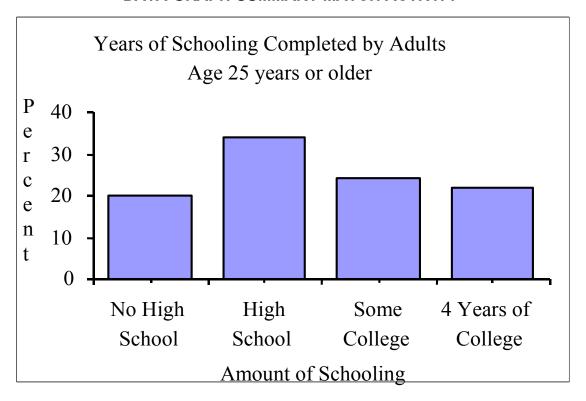Calories

DATA-GRAPH-SUMMARY MATCH ACTIVITY

The data represent the number of calories in a serving of different brands of ice cream and yogurt. The graph illustrates that ice cream generally has more calories. In fact, all of the brands of ice cream examined have higher calories than all of the brands of yogurt selected. The maximum number of calories for yogurt is 200 calories compared to the minimum number of calories for ice cream is 220 calories. Furthermore, the median number of calories for ice cream is approximately 270 calories compared to 170 calories for yogurt. Both ice cream and yogurt have similar ranges and variation. Yogurt's range is approximately 100 calories and its interquartile range is approximately 50 calories. Similarly, ice cream's range is about 125 calories and its interquartile range is about 50 calories.

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Years of Schooling	Percent
No High School	20
High School	34
Some College	24
4 Years of College	22

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Years of Schooling Completed by Adults
Age 25 years or older

Percent

40	
30	
20	
10	
0	

No High School | High School | Some College | 4 Years of College
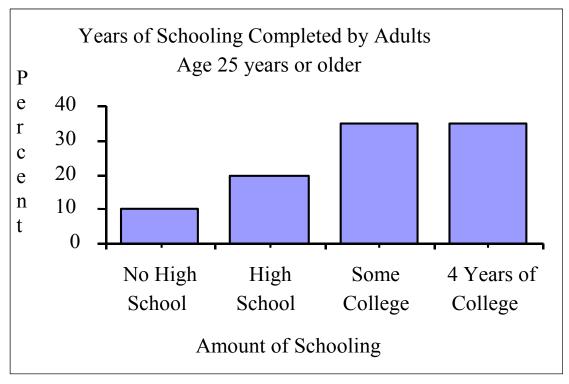
Amount of Schooling

DATA-GRAPH-SUMMARY MATCH ACTIVITY

The data represent the percent of adults, age 25 and older, who have completed a certain level of schooling. Based on the graph, it appears that nearly equal percentages completed no high school, some college, and four years of college. The largest percentage was those adults who completed high school only.

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Years of Schooling	Percent
No High School	10
High School	20
Some College	35
4 Years of College	35

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Years of Schooling Completed by Adults Age 25 years or older
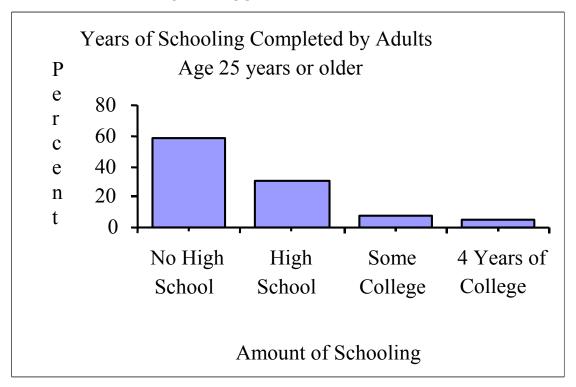
DATA-GRAPH-SUMMARY MATCH ACTIVITY

The data represent the percent of adults, age 25 and older, who have completed a certain level of schooling. Based on the graph, it appears that this population is fairly well educated with approximately 70 percent completing at least some college. Those completing no high school made up the smallest percentage at only 10 percent of the population.

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Years of Schooling	Percent
No High School	58
High School	30
Some College	7
4 Years of College	5

DATA-GRAPH-SUMMARY MATCH ACTIVITY

Years of Schooling Completed by Adults Age 25 years or older

Percent

80	
60	
40	
20	
0	

No High School   High School   Some College   4 Years of College

Amount of Schooling

DATA-GRAPH-SUMMARY MATCH ACTIVITY

The data represent the percent of adults, age 25 and older, who have completed a certain level of schooling. Based on the graph, it appears that the majority of this population has not completed high school. Those with some college and/or 4 years make up less than 15% of the entire population. These facts suggest that the population is not well educated.

Activity: Name That Graph

Format: Large Group/Small Group

Objective: Participants will understand how to choose a graphical method that best displays a set of data.

Related SOL   4.20, 5,18, 6.18, 7.17, 8.12

Materials: Name That Graph Activity Sheet, Name That Graph Recording Sheet

Time Required: 30 minutes

Directions:
1. Distribute the Name That Graph Activity and Recording Sheets to participants. Participants examine the various graphs and decide on a specific collection of data that exists in the room that could fit one of the graphs shown. An example may be the number of family members in each participant's home for graph 2.

2. The instructor should facilitate the actual collection of the data chosen by having participants raise hands or some other method. Participants decide if the graphical display chosen is accurate. Discuss what other graphs could have been chosen, if any, for the data.

3. Encourage participants to work in small groups and come up with another set of data that will match a different graphical display. Participants collect the data and decide if their choice of graphs was accurate.

4. Collect Recording Sheets from each participant.

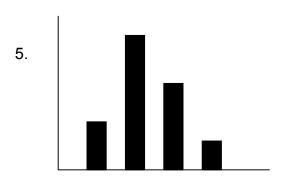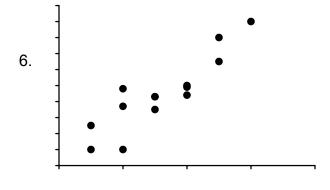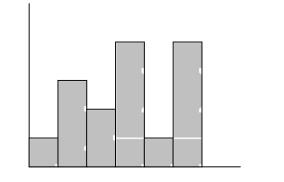5. Lead a discussion with the large group.

Name That Graph

1.
```
    X  X  X  X
    X  X  X  X  X  X  X
X       X  X  X  X  X  X  X  X
```

2.

3.

4.
```
0 | 3  3  5  7  8  9
1 | 0  2  3  5  6  6  8  9
2 | 0  1  3  3  3  5  5  8
3 | 0  5
4 | 5
```

5.

6.

7.

8.

Name That Graph
Recording Sheet

Name _____ Date _____

1. What graphical display will best represent the data you plan to collect?

2. Describe the data you will collect.

After the Data Collection

3. Is the graphical display you chose appropriate for the data you collected? Why or why not?

4. Is there another graph that would be more appropriate for the data you collected? If so, what one would it be?

5. Choose another graphical display and describe the data collection you would use for that display.

Activity: Draw the Graph

Format: Small Groups (2-3 participants) and individual work

Objectives: Participants will develop skills in interpreting graphical representations of data. They will discuss statistics that can be developed from graphs, compare and contrast data, find unique and common features, describe trends and relationships between variables, and make predictions from the data.

Related SOL: 1.19, 2.23, 3.22, 4.20, 5.18, 6.18, 7.18, 8.12

Materials: Three different graphs for groups (types of graphs and level of analysis should vary depending on the grade level of the participants)
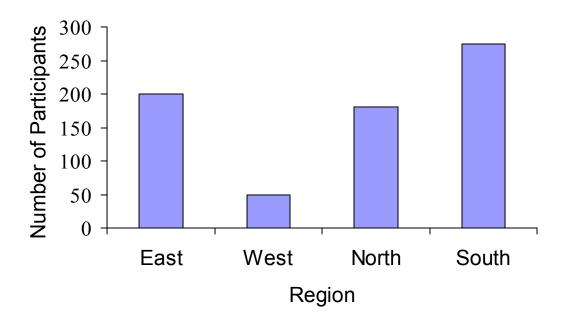
Time Required: 20 minutes

Directions:
1. Each individual participant in the group is given a different graph. Participants should not allow other members of their group to see their graph. Individually, the participants should write a summary of the graph using key words appropriate to the type of graph illustrated. The summaries should focus on comparing and contrasting categories, describing trends, identifying outliers and clusters. The summaries should not report numbers (such as, in 1990, there were 20 people and, in 1995, there were 300 people) or non-interpretative statements about the graph.

2. After each individual has written their summary, the group will play the game "Draw that Graph". In this game, there should be two "drawers" and one "analyzer". The analyzer will be the person whose graph is being drawn. The other two members of the group will be drawers. The analyzer reads his/her summary slowly to the group and the other two members attempt to recreate the graph. The analyzer cannot give specifics about where to draw what lines or points. Rather, he/she must rely on the written analysis. After the drawers are finished, the group can compare the graphs to the original graph and discuss what parts of the summary allowed them to graph the data and what could have been included in the summary to better explain the graph.

Graph 1
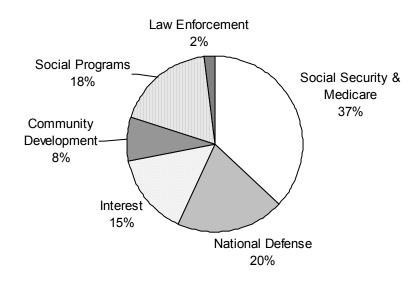
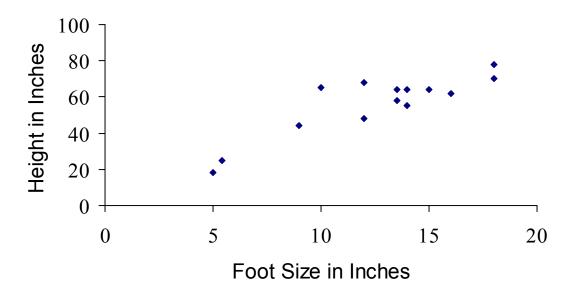## Number of Participants in Training Program

Summary:

Graph 2:

Federal Outlays

Summary:

Graph 3:

Foot Size versus Height

Summary:

Activity: Interpreting the Data

Format: Pairs, Small groups

Objectives: Participants will use the sample question information and previous session work products to help them generate possible SOL assessment questions. Participants will learn which higher-order thinking skills are addressed in the sample questions.

Related SOL: Reflection and review of previously discussed Probability and Statistics SOL.

Materials: Copies of graphs from previous sessions, sample questions, Name That Graph Activity Sheet, chart paper, and markers

Time Required: 30 minutes

Directions:
1. Participants work in pairs, using the sample questions and the graphs from the Name That Graph Activity Sheet. They discuss the data they collected and the graph they chose in relationship to the sample questions. They decide if they chose appropriate displays for the question they were answering. Were there other ways they could have organized the data to achieve similar results?

2. After some large group discussion about the sample questions and appropriate displays, the participants reorganize into grade level groups.

3. The instructor will have selected some of the graphs done in the previous sessions to use at this time. Enough copies of these graphs should be available to the appropriate grade level groups. Some possible graphs:
   Session II   Activities 6 and 7
   Session III   Activities 1, 2, 3, 4, 5, and 6
   Session IV   Activities 2, 3, and 4

4. Participants use these graphs to generate multiple-choice questions that could be asked on the SOL assessments. Questions should focus on interpretation and analysis of the graphs as well as alternative methods used to display data. For example: What would this bar graph look like as a stem-and-leaf plot?

5. Each grade-level group writes at least two multiple-choice questions on chart paper for others to copy.

Sample Questions and Stems for Assessing Reasoning

Skill	Questions
Abstracting	What's the general pattern here? Where else does it apply? How can it be represented in another form (graphically, etc.)?
Applying	Using the principals of…as a guide, describe how you would solve the problem. Describe a situation that can be illustrated by using….
Analyzing	List the main characteristics of…
Classifying	What do the items have in common? How else could the items be grouped?
Comparing	Describe the similarities and differences between… Compare the following two methods for… How are these alike? How are these different?
Creating	Make up a story describing what you see in this graph. List as many ways as you can think of for describing…
Deduction	What can you deduce from this data display?
Decision Making	What would be the best? …the worst? Which one has the most? …the least?
Error Analysis	What specific errors have been made? How can they be fixed?
Evaluating	Describe the strengths and weaknesses of… Using the given criteria, write an evaluation of…
Generalizing	Formulate several valid generalizations from the data.
Induction	What conclusions/generalizations can you draw from this? What support do you have for these conclusions?
Inferring	In light of the data presented, what is the most likely to happen when…? How would _____ be likely to react to the following issue?

Justifying	Which of the following alternatives would you favor and why? Using the data, explain why you agree or disagree with the following statement……
Relating Cause and Effect	What are the major causes of…? What would be the most likely effect on the data of…?
Summarizing	State the main points shown in the data display. Briefly summarize the data displayed.
Synthesizing	Describe a plan for proving that…. Write a well-organized report that shows…..